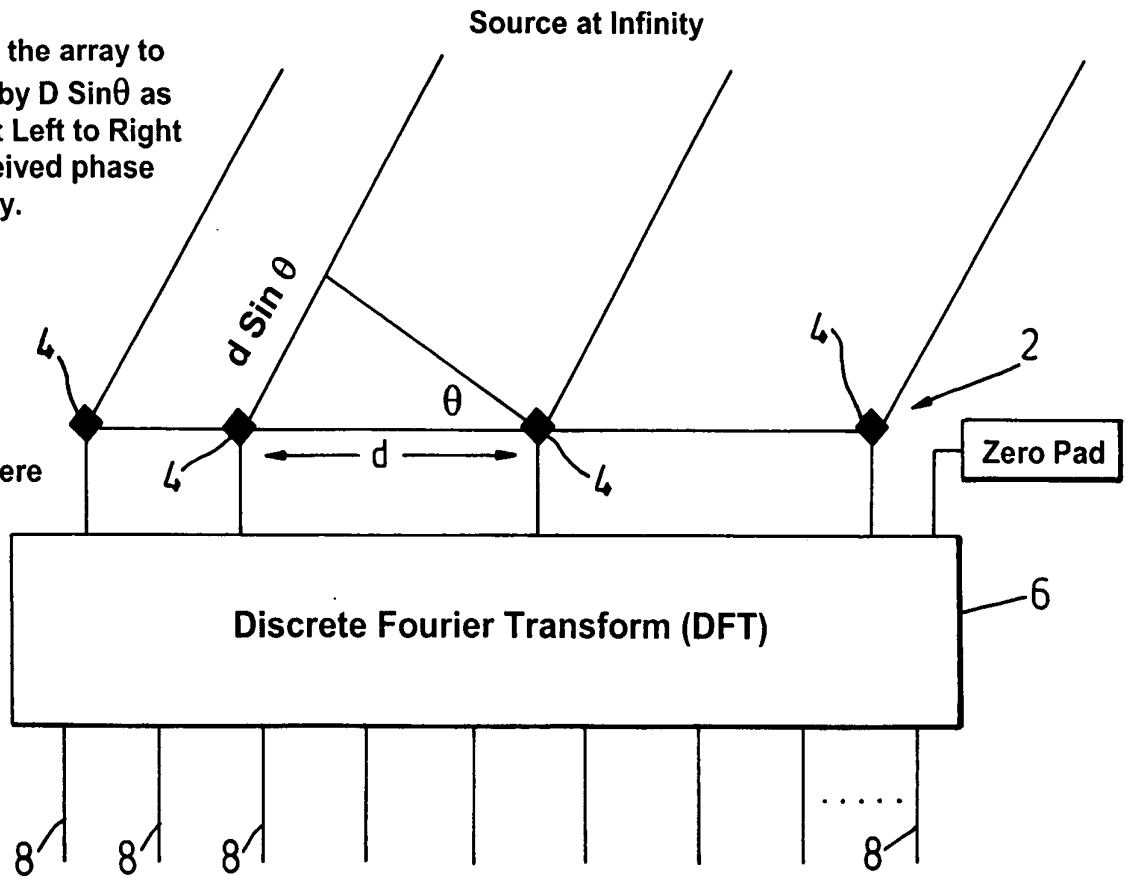
The path length from the array to the source shortens by D Sinθ as shown for movement Left to Right along the array. Received phase advances accordingly.

The DFT will have as many input ports as there are elements



The number of output bins (Angles of Arrival) is selected on the basis of the required angle discrimination. Such discrimination and the sidelobe structure will be determined solely by the number and distribution of the input ports.

Fig. 1

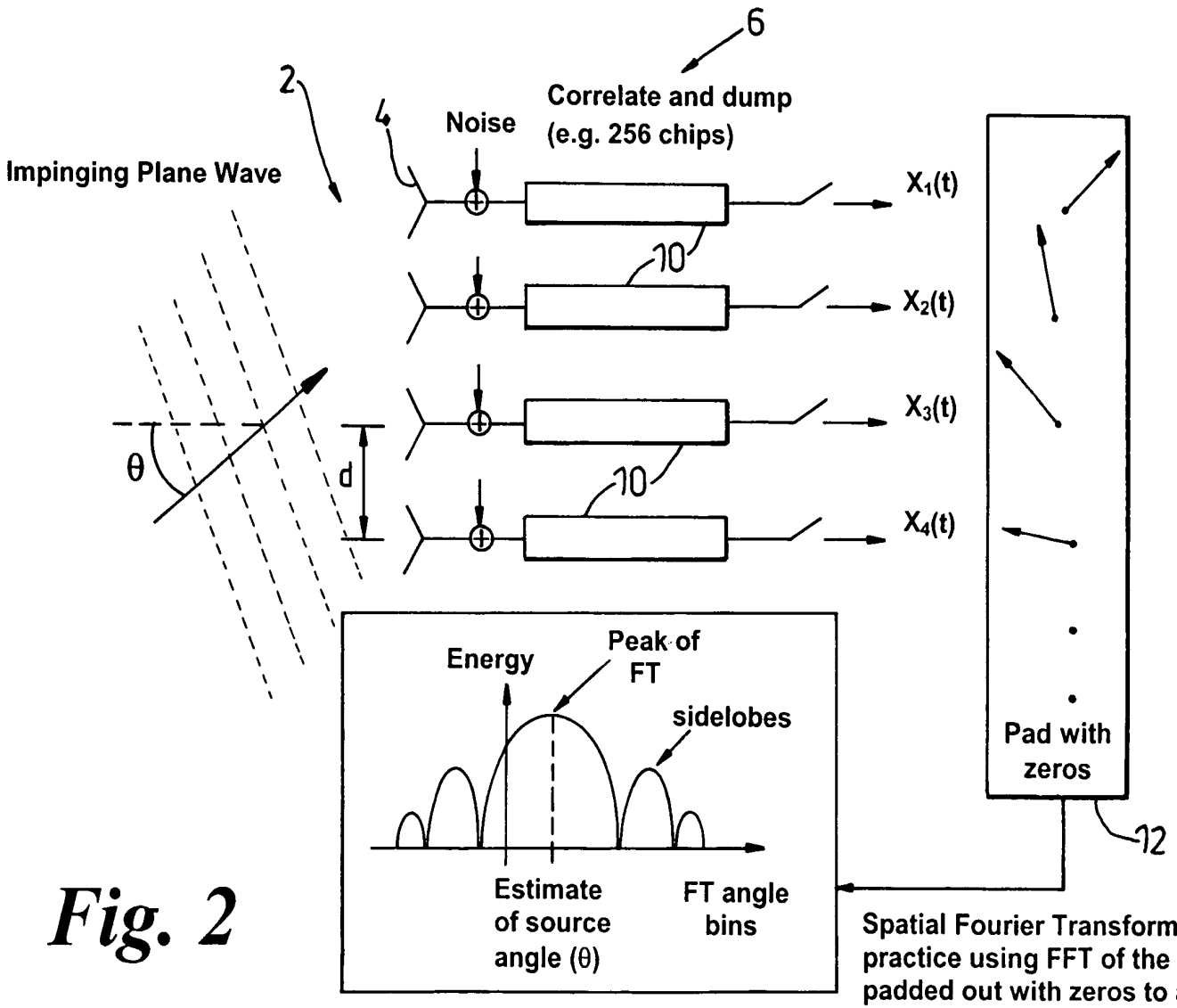


Fig. 2

Spatial Fourier Transform (carried out in practice using FFT of the input sequence padded out with zeros to achieve sufficient angle quantisation)

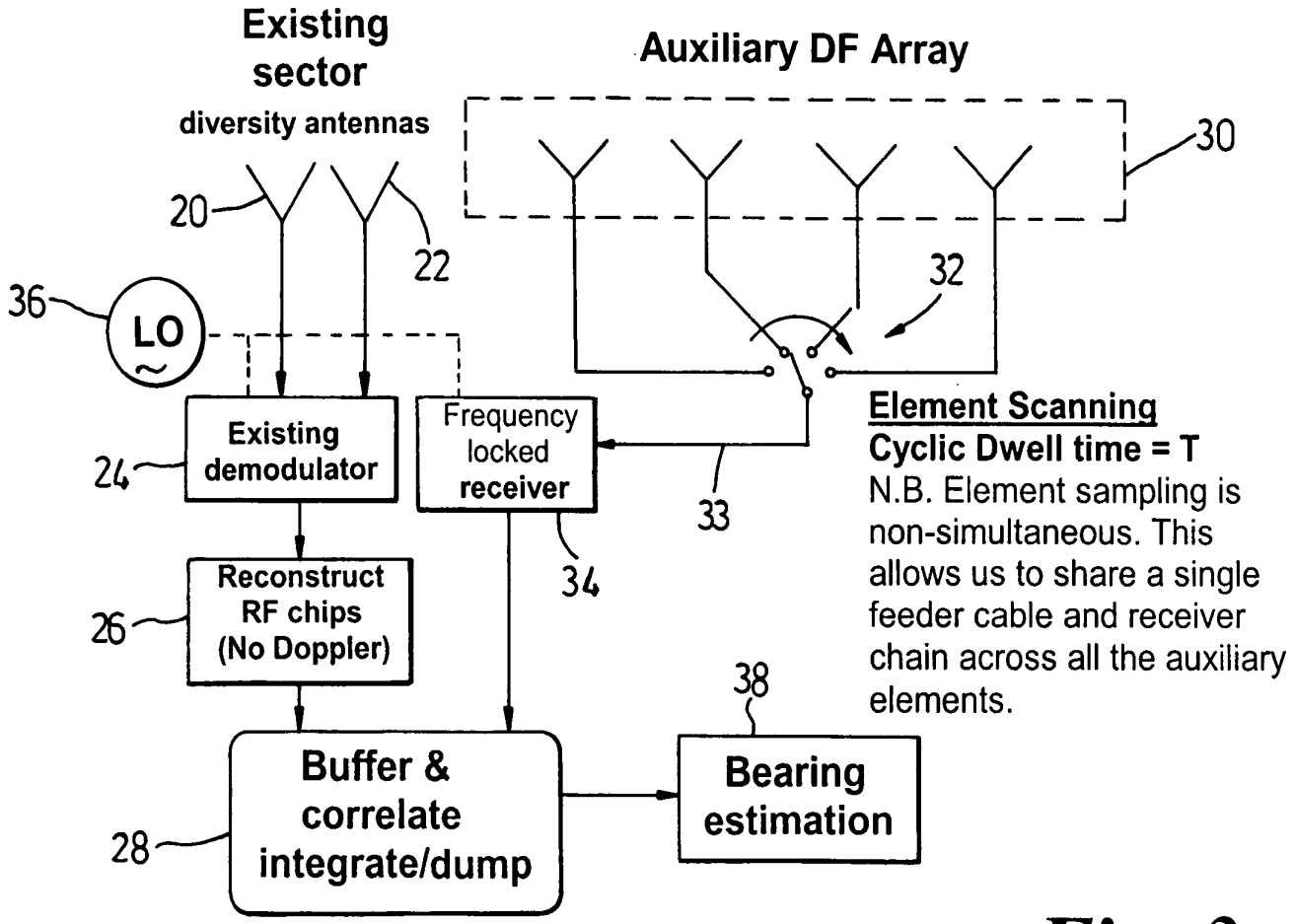
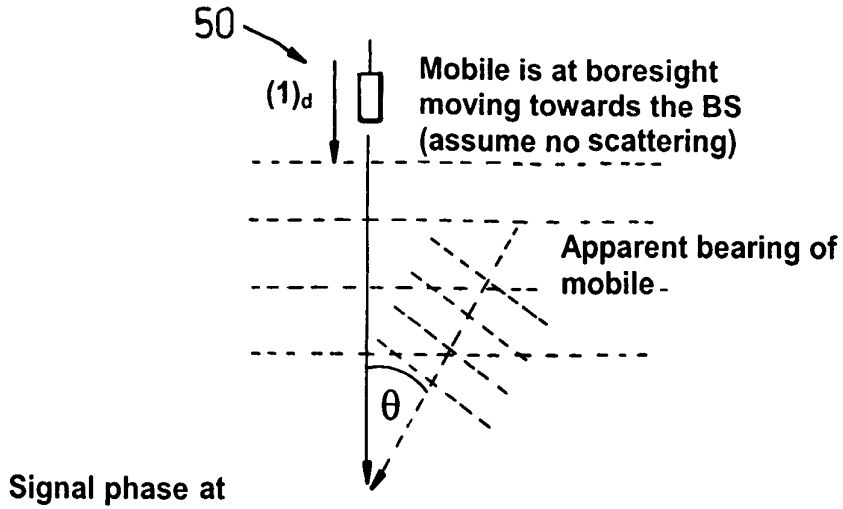
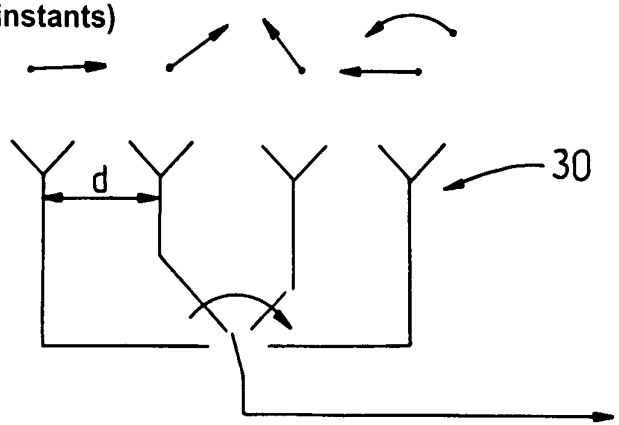
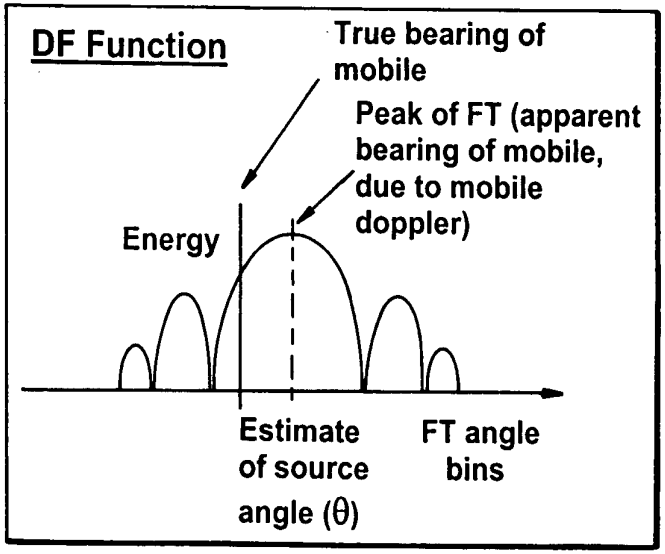


Fig. 3



Signal phase at antenna elements (at sample instants)





Element Scanning
Cyclic Dwell time = T
N.B. Element sampling is non-simultaneous. This allows us to share a single feeder cable and receiver chain across all the auxiliary elements.

Fig. 4

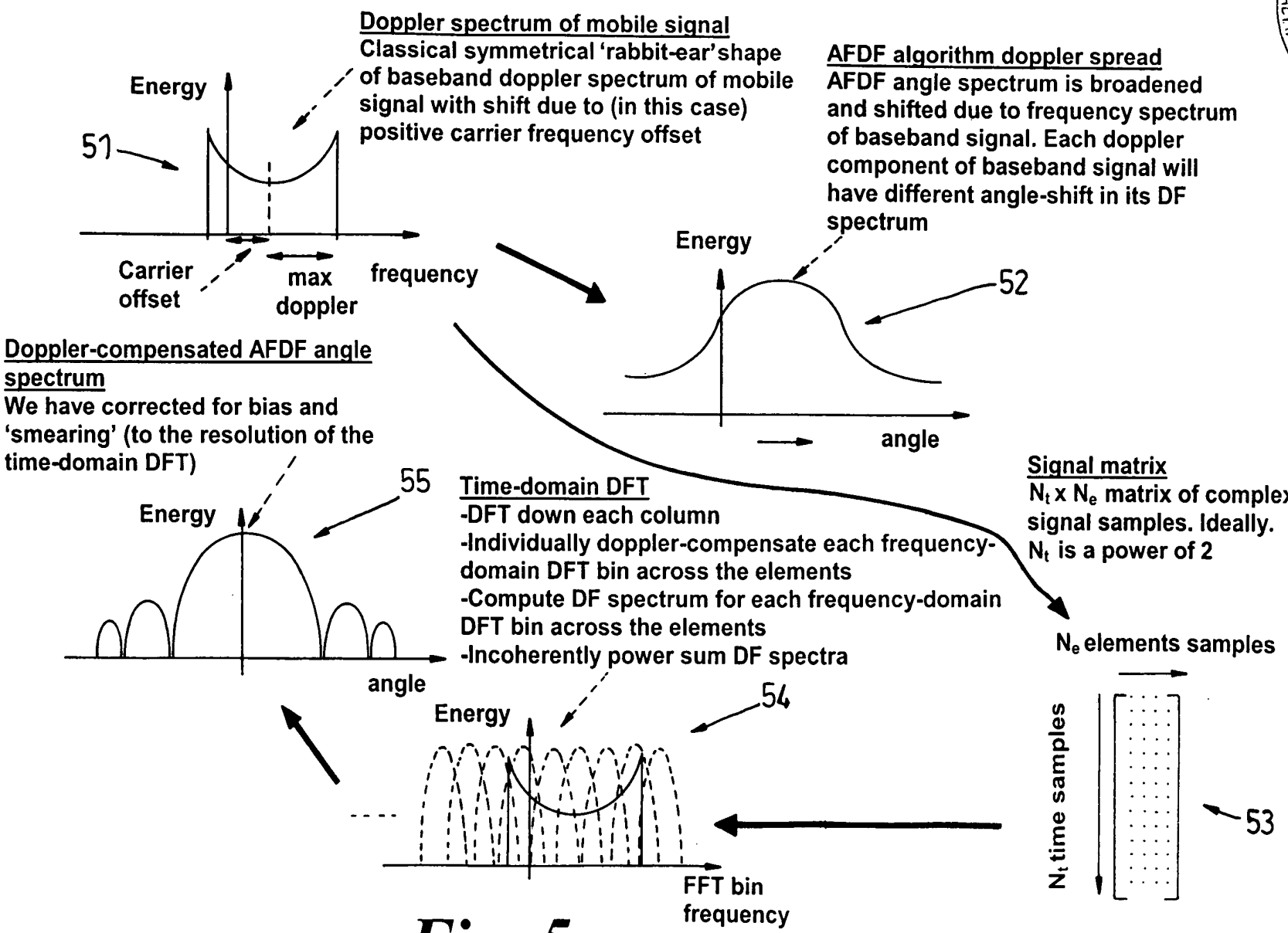


Fig. 5

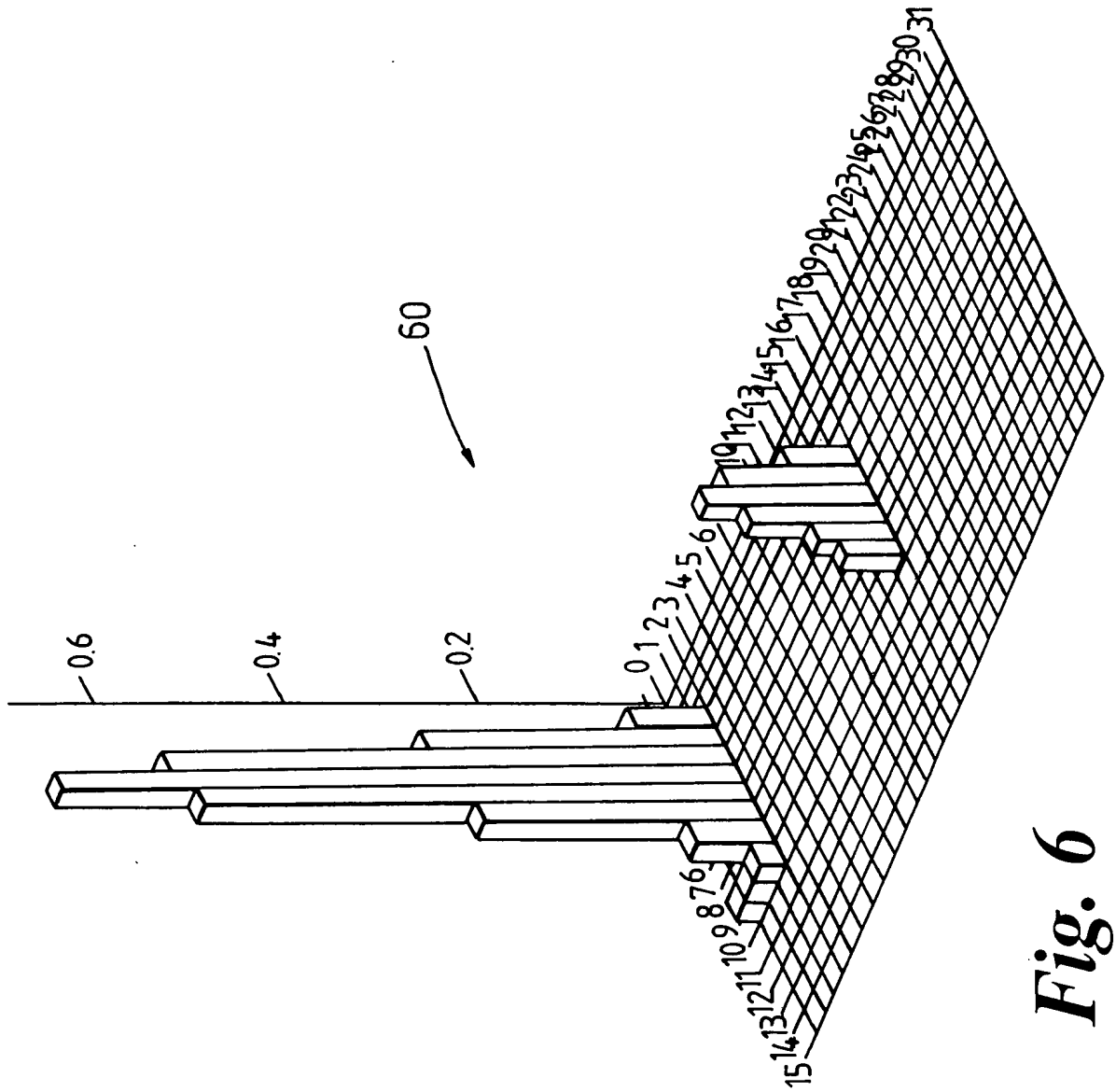
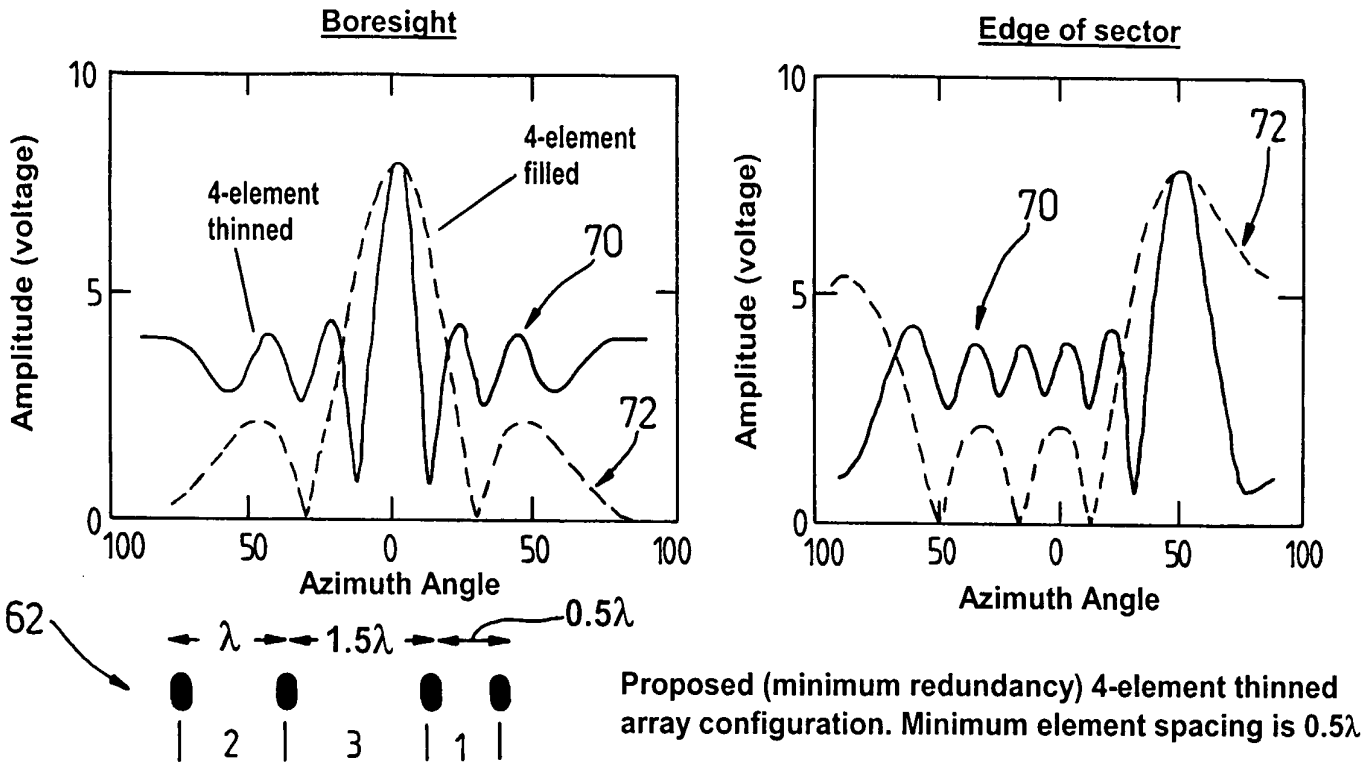


Fig. 6



Proposed (minimum redundancy) 4-element thinned array configuration. Minimum element spacing is 0.5λ

- The selected thinned array configuration biases elements towards the edge of the available aperture and achieves a –3dB beam width of 11° (N.B. Narrower beamwidth than a 7-element filled array due to the 'end-weighting').

- Peak sidelobes close to the –6dB target level are achieved even when the main beam is scanned towards the edge of the sector.

Fig. 7

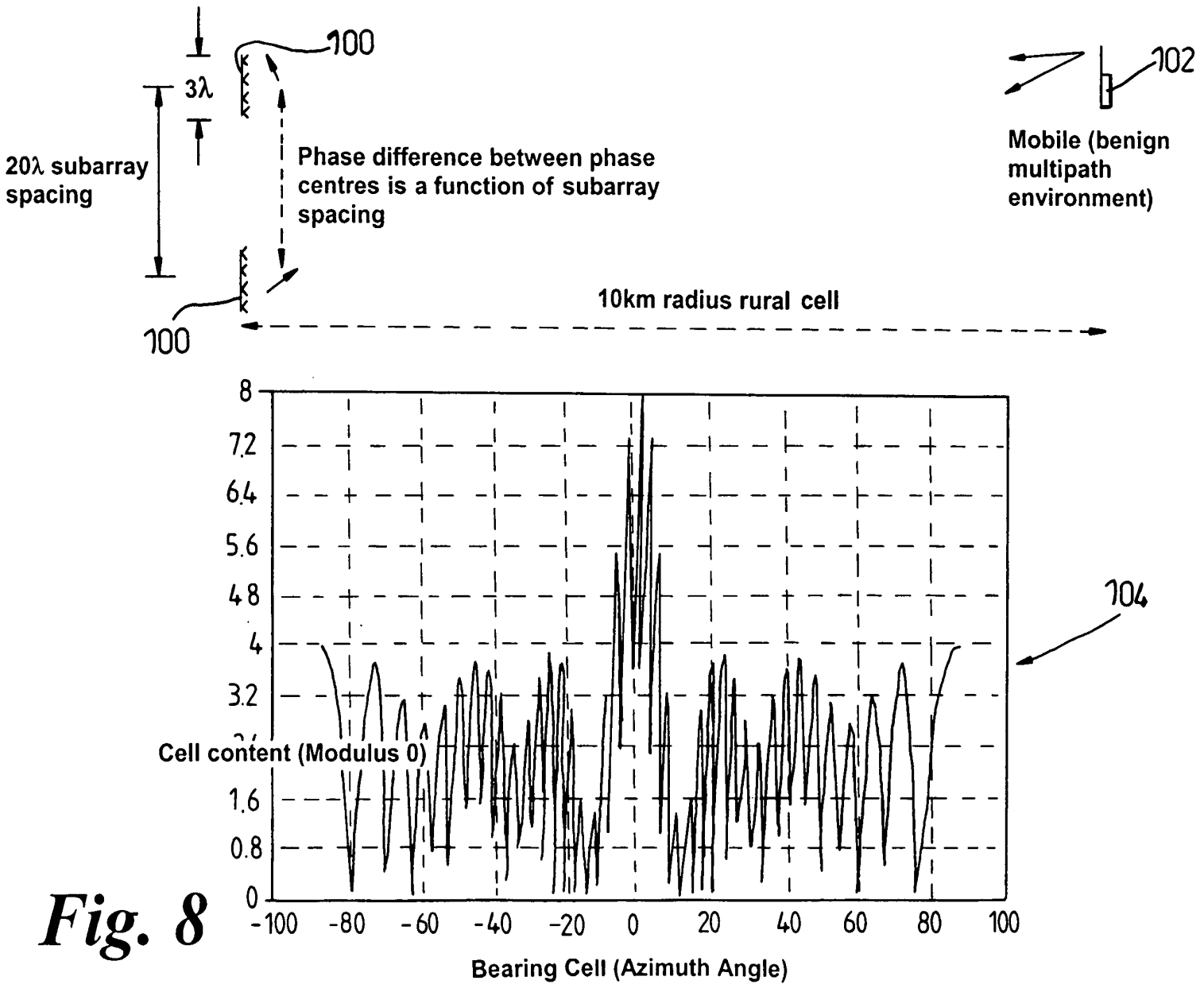
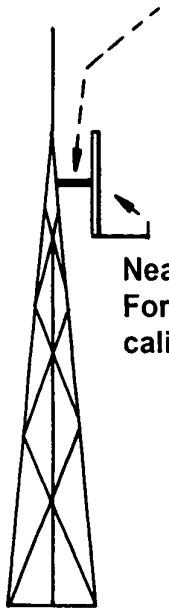


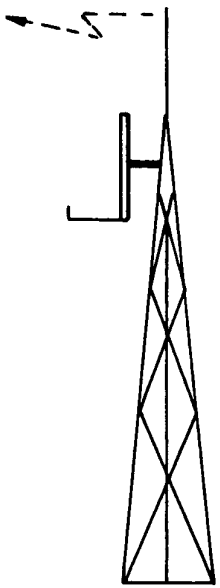
Fig. 8

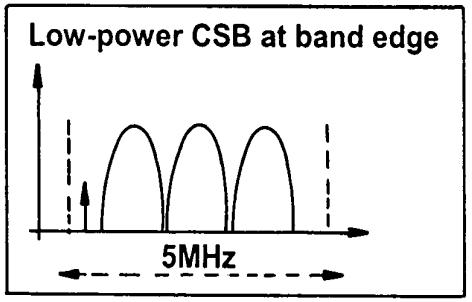
Cellsite Beacon (CSB)
-12dBm maximum
For alignment calibration only

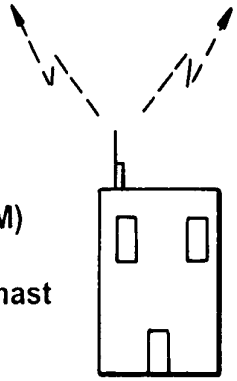
Direct calibration signal injection
For filter/cable calibration only



Near-field probe
For radome/filter/cable
calibration only







Autonomous Beacon Mobile (ABM)
+23dBm maximum
Mounted on prominent building/mast
For alignment calibration *and*
radome/filter/cable calibration

Calibration Strategy
- Calibrate alignment of every DF antenna array overnight using CSB or ABM
- Calibrate on-frequency phase errors due to radome/filters/cables using near-field probe direct injection or ABM during or just after E911 emergency call.

Fig. 9

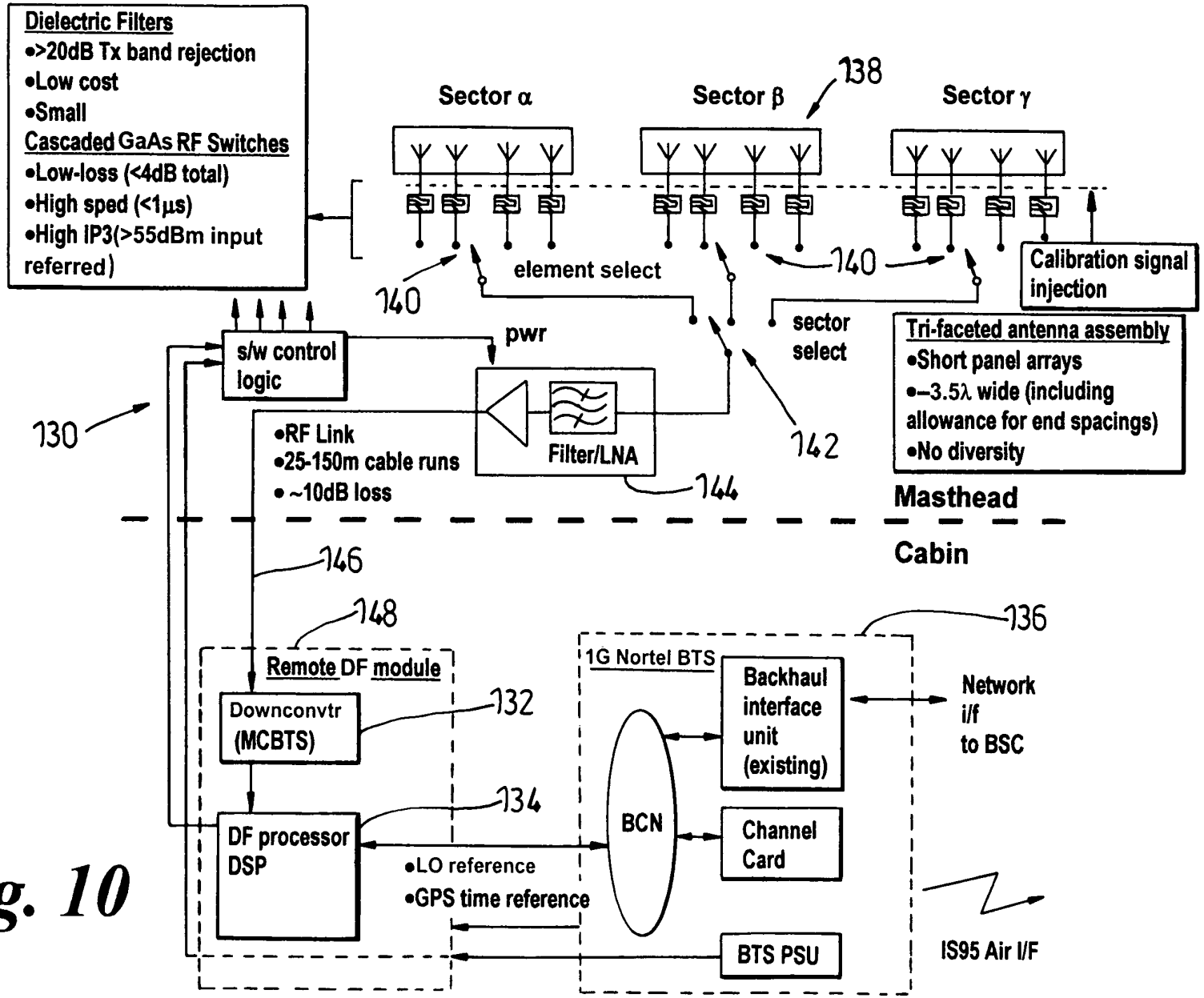


Fig. 10

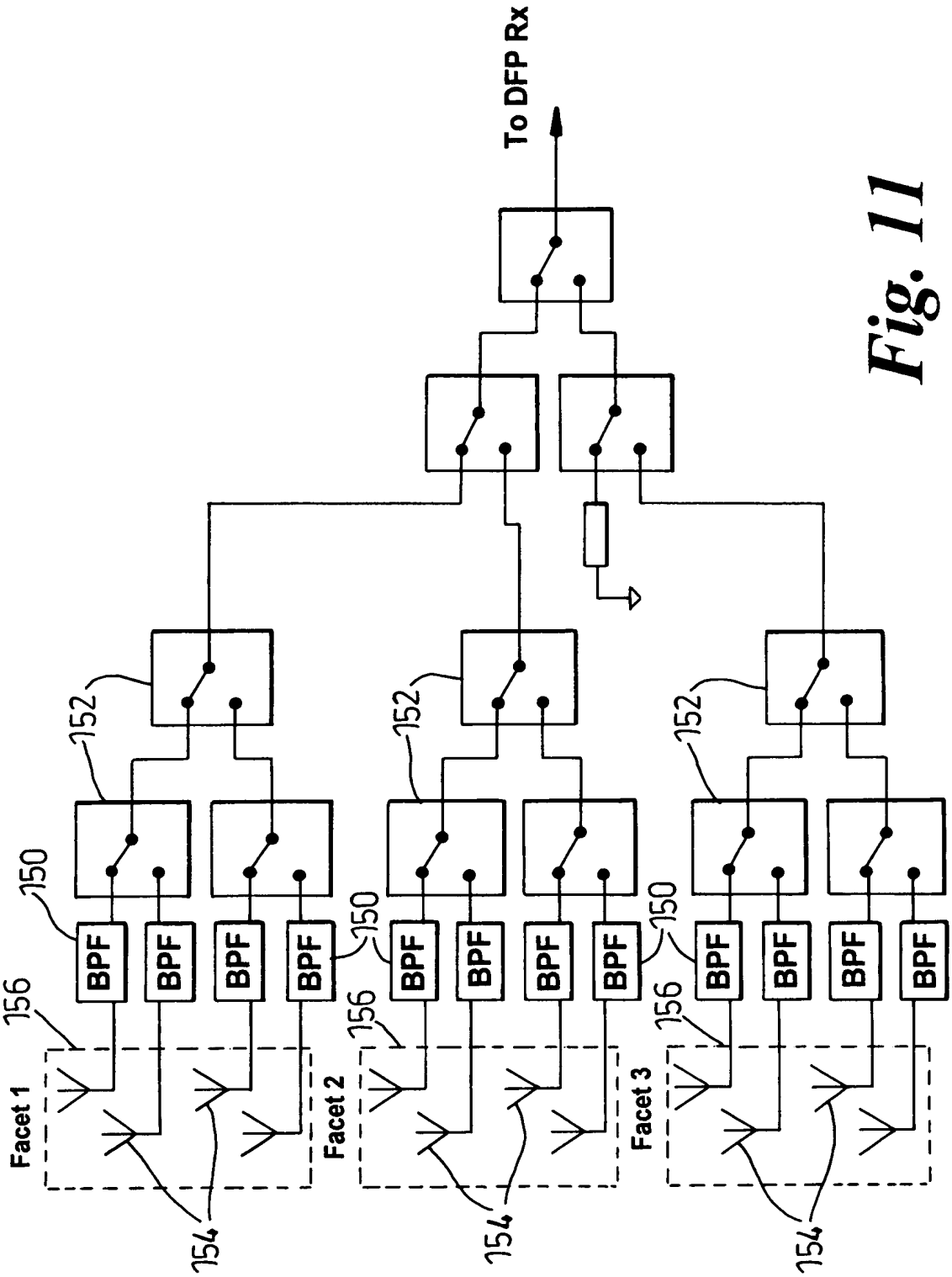


Fig. 11